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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the **PATENT APPLICATION** of:

Lomp et al.

Application No.: Not Yet Known

Our File: I-2-91.6US

Filed: Not Yet Known

Date: January 10, 2001

For: CODE DIVISION MULTIPLE ACCESS (CDMA)
COMMUNICATION SYSTEM

Group: Not Yet Known

Examiner: Not Yet Known

PRELIMINARY AMENDMENT

Box PATENT APPLICATION
Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to the initial Office Action, Applicants respectfully request that the application be amended as follows.

IN THE TITLE

Please delete the title in its entirety and insert therefor --RAPID ACQUISITION SPREADING CODES FOR SPREAD-SPECTRUM COMMUNICATIONS--.

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IN THE SPECIFICATION

On page 1, at line 1, after "This application" delete "claims the benefit of" and insert therefor --is a continuation of U.S. Application No. 08/956,980, filed October 23, 1997; which is a divisional of U.S. Application No. 08/669,775, filed June 27, 1996, now U.S. Patent No. 5,799,010; which claims priority from--.

IN THE CLAIMS

Please cancel claims 1-14 without prejudice.

Please add the following new claims:

--15. A method for rapidly acquiring a spreading code, used in a code division multiple access (CDMA) system, the method comprising the steps of:

generating a first long code and a second long code, with each long code having a length N chips, with the first long code different from the second long code;

transmitting, over a communications channel using radio waves, the first long code and the second long code, at a first phase angle and at a second phase angle, respectively, on a carrier signal, with the first phase angle different from the second phase angle; and

acquiring, from the communications channel, using two phase-acquisition circuits in parallel, the first long code and the second long code from the first phase angle and the

10 second phase angle, respectively, by searching, in parallel, $N/2$ chips, the first long code and the second long code.

16. The method as set forth in claim 15, with the step of transmitting including the step of transmitting the first long code and the second long code, at an in-phase (I) angle and at a quadrature-phase angle, respectively, on the carrier signal, with the I-phase angle ninety degrees out of phase with the Q-phase angle.

17. The method as set forth in claim 16, with the step of acquiring including the step of acquiring, from the communications channel, using an I-phase acquisition circuit and a Q-phase acquisition circuit in parallel, the first long code and the second long code from the I-phase angle and the Q-phase angle, respectively, of the carrier signal by searching, in parallel, $N/2$ chips, the first long code and the second long code.

18. The method as set forth in claim 15, with the step of transmitting including the step of transmitting the first long code and the second long code, at an in-phase (I) angle and at a quadrature-phase (Q) angle, respectively, on the carrier signal, with the I-phase angle ninety degrees out of phase with the Q-phase angle.

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19. The method as set forth in claim 18, with the step of acquiring including the
step of acquiring, from the communications channel, using an I-phase acquisition circuit and
a Q-phase acquisition circuit in parallel, the first long code and the second long code from
the I-phase angle and the Q-phase angle, respectively, of the carrier signal by searching, in
parallel, $N/2$ chips, the first long code and the second long code.

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20. The method as set forth in claim 15, with the step of generating including the
step of generating the first long code and the second long code, from a multiplicity of short
codes, with each short code different from other short code in the multiplicity of short codes,
and each short code in the multiplicity of short codes having a length less than N chips, with
a first short code thereby embedded in the first long code, and a second short code embedded
in the second long code.

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21. The method as set forth in claim 20, with the step of acquiring including the
step of acquiring, from the communications channel, using the two phase-acquisition circuits
in parallel, the first short code embedded in the first long code, and the second short code
embedded in the second long code, from the first phase angle and the second phase angle,
respectively, by searching, in parallel, $N/2$ chips, the first short code and the second short
code.

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22. A method for rapidly acquiring a spreading code, used in a code division multiple access (CDMA) system, the method comprising the steps of:

generating a plurality of P long codes, where P is a number of long codes in the plurality of long codes, with each long code having a length N chips, with each long code different from other long codes in the plurality of long codes;

transmitting, over a communications channel using radio waves, the plurality of long codes at a plurality of phase angles, respectively, on a carrier signal, with each phase angle in the plurality of phase angles different from other phase angles in the plurality of phase angles; and

acquiring, from the communications channel, using phase-acquisition means, the plurality of long codes, respectively, by searching, in parallel, N/P chips, each long code of the plurality of long codes.

23. The method as set forth in claim 22, with the step of transmitting including the step of transmitting the plurality of long codes, at the plurality of phase angles.

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24. The method as set forth in claim 23, with the step of acquiring including the step of acquiring, from the communications channel, using the phase-acquisition means, the plurality of long codes from the plurality of phase angles, respectively, of the carrier signal by searching, in parallel, N/P chips, of each of the plurality of long codes.

25. The method as set forth in claim 23, with the step of transmitting including the step of transmitting the plurality of long codes at the plurality of phase angles, respectively, on the carrier signal, with each phase angle in the plurality of phase angles representing an M-ary phase scheme.

26. The method as set forth in claim 25, with the step of acquiring including the step of acquiring, from the communications channel, using the phase-acquisition means, the plurality of long codes, respectively, of the carrier signal by searching, in parallel, N/P chips, of the first long code and the second long code.

27. The method as set forth in claim 23, with the step of generating including the step of generating the plurality of long codes, from a multiplicity of short codes, with each short code different from other short code in the multiplicity of short codes, and each short code in the multiplicity of short codes having a length less than N chips, with a first short

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- 5 code of the short codes multiplicity thereby embedded in a first long code of the long codes multiplicity, and a second short code of the short codes multiplicity embedded in a second long code of the long codes multiplicity.

28. The method as set forth in claim 27, with the step of acquiring including the step of acquiring, from the communications channel, using the phase-acquisition means, the first short code embedded in the first long code, and the second short code embedded in the second long code, from the first phase angle and the second phase angle, respectively, by searching, in parallel, N/P chips, the first short code and the second short code.

29. A system for rapidly acquiring a spreading code, used in a code division multiple access (CDMA) system, the system comprising:

generator means for generating a first long code and a second long code, with each long code having a length N chips, with the first long code different from the second long code;

transmitter means for transmitting, over a communications channel using radio waves, the first long code and the second long code, at a first phase angle and at a second phase angle, respectively, on a carrier signal, with the first phase angle different from the second phase angle; and

10 acquisition means for acquiring, from the communications channel, using two phase-acquisition circuits in parallel, the first long code and the second long code from the first phase angle and the second phase angle, respectively, by searching, in parallel, $N/2$ chips, the first long code and the second long code.

30. The system as set forth in claim 29, with said transmitter means further including means for transmitting the first long code and the second long code, at an in-phase (I) angle and at a quadrature-phase angle, respectively, on the carrier signal, with the I-phase angle ninety degrees out of phase with the Q-phase angle.

31. The system as set forth in claim 30, with said acquisition means further including means for acquiring, from the communications channel, using an I-phase acquisition circuit and a Q-phase acquisition circuit in parallel, the first long code and the second long code from the I-phase angle and the Q-phase angle, respectively, of the carrier signal by searching, in parallel, $N/2$ chips, the first long code and the second long code.

32. The system as set forth in claim 29, with said transmitter means further including means for transmitting the first long code and the second long code, at an in-phase (I) angle and at a quadrature-phase (Q) angle, respectively, on the carrier signal, with the I-phase angle ninety degrees out of phase with the Q-phase angle.

33. The system as set forth in claim 32, with said acquisition means further including means for acquiring, from the communications channel, using an I-phase acquisition circuit and a Q-phase acquisition circuit in parallel, the first long code and the second long code from the I-phase angle and the Q-phase angle, respectively, of the carrier signal by searching, in parallel, $N/2$ chips, the first long code and the second long code.

53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

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34. The system as set forth in claim 29, with said generator means further including means for generating the first long code and the second long code, from a multiplicity of short codes, with each short code different from other short code in the multiplicity of short codes, and each short code in the multiplicity of short codes having a length less than N chips, with a first short code thereby embedded in the first long code, and a second short code embedded in the second long code.

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35. The system as set forth in claim 34, with said acquisition means further including means for acquiring, from the communications channel, using the two phase-acquisition circuits in parallel, the first short code embedded in the first long code, and the second short code embedded in the second long code, from the first phase angle and the second phase angle, respectively, by searching, in parallel, $N/2$ chips, the first short code and the second short code.

36. A method for rapidly acquiring a spreading code, used in a code division multiple access (CDMA) system, the method comprising the steps of:

generator means for generating a plurality of P long codes, where P is a number of long codes in the plurality of long codes, with each long code having a length N chips, with each long code different from other long codes in the plurality of long codes;

transmitter means for transmitting, over a communications channel using radio waves, the plurality of long codes at a plurality of phase angles, respectively, on a carrier signal, with each phase angle in the plurality of phase angles different from other phase angles in the plurality of phase angles; and

10 acquisition means for acquiring, from the communications channel, using phase-acquisition means, the plurality of long codes, respectively, by searching, in parallel, N/P chips, each long code of the plurality of long codes.

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37. The method as set forth in claim 36, with said transmitter means further including means for transmitting the plurality of long codes, at the plurality of phase angles.

38. The method as set forth in claim 37, with said acquisition means further including means for acquiring, from the communications channel, using the phase-acquisition means, the plurality of long codes from the plurality of phase angles, respectively, of the carrier signal by searching, in parallel, N/P chips, of each of the plurality of long codes.

39. The method as set forth in claim 36, with said transmitter means further including means for transmitting the plurality of long codes at the plurality of phase angles, respectively, on the carrier signal, with each phase angle in the plurality of phase angles representing an M-ary phase scheme.

40. The method as set forth in claim 39, with said acquisition means further including means for acquiring, from the communications channel, using the phase-acquisition means, the plurality of long codes, respectively, of the carrier signal by searching, in parallel, N/P chips, of the first long code and the second long code.

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41. The method as set forth in claim 36, with said generator means further including means for generating the plurality of long codes, from a multiplicity of short codes, with each short code different from other short code in the multiplicity of short codes, and each short code in the multiplicity of short codes having a length less than N chips, with a first short code of the short codes multiplicity thereby embedded in a first long code of the long codes multiplicity, and a second short code of the short codes multiplicity embedded in a second long code of the long codes multiplicity.

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42. The method as set forth in claim 41, with said acquisition means further including means for acquiring, from the communications channel, using the phase-acquisition means, the first short code of the short codes multiplicity embedded in the first long code of the long codes multiplicity, and the second short code of the short codes multiplicity embedded in the second long code of the long codes multiplicity, from the first phase angle and the second phase angle, respectively, by searching, in parallel, N/P chips, the first short code and the second short code.

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43. A system for rapidly acquiring a spreading code, used in a code division multiple access (CDMA) system, the system comprising:

a code generator for generating a first long code and a second long code, with each long code having a length N chips, with the first long code different from the second long code;

5 a transmitter, coupled to said code generator, for transmitting, over a communications channel using radio waves, the first long code and the second long code, at a first phase angle and at a second phase angle, respectively, on a carrier signal, with the first phase angle different from the second phase angle; and

10 an acquisition circuit, coupled to the communications channel, for acquiring, from the communications channel, using two phase-acquisition circuits in parallel, the first long code and the second long code from the first phase angle and the second phase angle, respectively, by searching, in parallel, $N/2$ chips, the first long code and the second long code.

44. The system as set forth in claim 43, with said transmitter further including means for transmitting the first long code and the second long code, at an in-phase (I) angle and at a quadrature-phase angle, respectively, on the carrier signal, with the I-phase angle ninety degrees out of phase with the Q-phase angle.

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45. The system as set forth in claim 44, with said acquisition circuit further including means for acquiring, from the communications channel, using an I-phase acquisition circuit and a Q-phase acquisition circuit in parallel, the first long code and the second long code from the I-phase angle and the Q-phase angle, respectively, of the carrier signal by searching, in parallel, $N/2$ chips, the first long code and the second long code.

46. The system as set forth in claim 43, with said transmitter further including means for transmitting the first long code and the second long code, at an in-phase (I) angle and at a quadrature-phase (Q) angle, respectively, on the carrier signal, with the I-phase angle ninety degrees out of phase with the Q-phase angle.

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47. The system as set forth in claim 46, with said acquisition circuit further including means for acquiring, from the communications channel, using an I-phase acquisition circuit and a Q-phase acquisition circuit in parallel, the first long code and the second long code from the I-phase angle and the Q-phase angle, respectively, of the carrier signal by searching, in parallel, $N/2$ chips, the first long code and the second long code.

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48. The system as set forth in claim 43, with said code generator further including means for generating the first long code and the second long code, from a multiplicity of short codes, with each short code different from other short code in the multiplicity of short codes, and each short code in the multiplicity of short codes having a length less than N chips, with a first short code thereby embedded in the first long code, and a second short code embedded in the second long code.

49. The system as set forth in claim 48, with said acquisition circuit further including means for acquiring, from the communications channel, using the phase-acquisition circuit, the first short code embedded in the first long code, and the second short code embedded in the second long code, from the first phase angle and the second phase angle, respectively, by searching, in parallel, $N/2$ chips, the first short code and the second short code.

50. A system for rapidly acquiring a spreading code, used in a code division multiple access (CDMA) system, the system comprising the steps of:

a code generator for generating a plurality of P long codes, where P is a number of long codes in the plurality of long codes, with each long code having a length N chips, with each long code different from other long codes in the plurality of long codes;

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a transmitter, coupled to said code generator, for transmitting, over a communications channel using radio waves, the plurality of long codes at a plurality of phase angles, respectively, on a carrier signal, with each phase angle in the plurality of phase angles different from other phase angles in the plurality of phase angles; and

10 an acquisition circuit, coupled to the communications channel, for acquiring, from the communications channel, using said phase-acquisition circuit, the plurality of long codes, respectively, by searching, in parallel, N/P chips, each long code of the plurality of long codes.

51. The system as set forth in claim 50, with said transmitter further including means for transmitting the plurality of long codes, at the plurality of phase angles.

52. The system as set forth in claim 51, with said acquisition further including means for acquiring, from the communications channel, using the phase-acquisition circuit, the plurality of long codes from the plurality of phase angles, respectively, of the carrier signal by searching, in parallel, N/P chips, of each of the plurality of long codes.

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53. The system as set forth in claim 50 with said transmitter further including means for transmitting the plurality of long codes at the plurality of phase angles, respectively, on the carrier signal, with each phase angle in the plurality of phase angles representing an M-ary phase scheme.

54. The system as set forth in claim 53, with said acquisition further including means for acquiring, from the communications channel, using the phase-acquisition circuit, the plurality of long codes, respectively, of the carrier signal by searching, in parallel, N/P chips, of the first long code and the second long code.

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55. The system as set forth in claim 50, with said generator further including means for generating the plurality of long codes, from a multiplicity of short codes, with each short code different from other short code in the multiplicity of short codes, and each short code in the multiplicity of short codes having a length less than N chips, with a first short code thereby embedded in a first long code, and a second short code embedded in a second long code.

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56. The system as set forth in claim 55, with said acquisition further including means for acquiring, from the communications channel, using the phase-acquisition circuit, the first short code embedded in the first long code, and the second short code embedded in the second long code, from the first phase angle and the second phase angle, respectively, by searching, in parallel, N/P chips, the first short code and the second short code.--

IN THE ABSTRACT

Please delete the Abstract in its entirety and insert therefor

--A method and system for rapidly acquiring a spreading code, used in a code division multiple access (CDMA) system. A first long code and a second long code, with each long code having a length of N chips, are generated. The first long code is different from the second long code. The first long code and the second long code are transmitted at a first phase angle and at a second phase angle, respectively, on a carrier signal, over a communications channel using radio waves. The first long code and the second long code may be transmitted at an in-phase (I) angle and at a quadrature-phase (Q) angle, respectively, on the carrier signal. From the communications channel, an I-phase acquisition circuit and a Q-phase acquisition circuit may acquire, in parallel, the first long code and the second long code from the I-phase angle and the Q-phase angle, respectively, of the carrier signal by searching, in parallel, N/2 chips, the first long code and the second long code.--

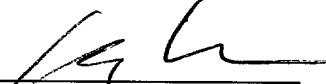
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REMARKS

By this Preliminary Amendment, Applicants cancel claims 1-14 and add new claims 15-56, amends the title, amends the specification to update the priority information and amends the abstract. Entry of this Amendment is respectfully requested.

Respectfully submitted,

Lomp et al.

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